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Is reoperation an option for patients with temporal lobe epilepsy after failure of surgery?

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ABSTRACT

Purpose: Epilepsy surgery is the most efficacious therapeutic modality for patients with medically refractory focal epilepsies, but surgical failures remain a challenge to the epilepsy treatment team. The aim of present study was to evaluate the postoperative outcome of patients who underwent reoperation after a failed epilepsy surgery on the temporal lobe.
Methods: We systematically analyzed the results of comprehensive preoperative evaluations before the first surgery, and before and after reoperation in 17 patients with drug resistant temporal lobe epilepsies.
Results: Overall, 13 of 17 patients (76.5%) improved after reoperation: five patients (29.4%) were completely seizure free after reoperation (median duration 60 months, range 12–72); six patients (35.3%) were seizure free at least 12 month before observation points (median duration 120.5 months, range 35–155) and two patients (11.8%) had a decrease in seizure frequency. Four patients (23.5%) remained unchanged with respect to seizure frequency and severity. There was no correlation between the improvement in seizure outcome after reoperation and other clinical data except of the history of traumatic brain injury (TBI). The patients who had no history of TBI improved after reoperation, compared to patients with TBI ($p = 0.044$). The postoperative seizure outcome of patients with incongruent Video-EEG results before the first surgery ($p = 0.116$) and before reoperation ($p = 0.622$) was not poorer compared to patients with congruent Video-EEG results.
Conclusions: Reoperation can considerably improve the operative outcome of the first failed epilepsy surgery in patients with drug resistant temporal lobe epilepsies. Epilepsy centres should be encouraged to report the results of failed epilepsy surgeries.

1. Introduction

Temporal lobe epilepsy (TLE) is the most frequent and drug-resistant syndrome among the refractory focal epilepsy syndromes. Over the last few decades epilepsy surgery has proved to be a successful and effective method for the treatment of patients with medically refractory temporal lobe epilepsy providing 60–70% freedom from disabling seizures.[1] The aim of surgical treatment is to achieve seizure freedom with the smallest possible postsurgical neuropsychological deficit.

In many epilepsy centres selective amygdalohippocampectomy via the transsylvian route was established as a common surgical procedure for treatment of temporal lobe epilepsies[2] since it appears to have more favourable cognitive outcome compared with standard anterior temporal lobectomy.[3,4] However, restrictive operation types can reduce the efficiency of seizure control. Insufficient removal of the epileptogenic zone, multifocal epileptic discharges caused by an extended network within the ipsilateral hemisphere[5] or an independent contralateral temporal epileptogenic zone 6 can lead to an unsatisfying outcome after epilepsy surgery. Up to 40% of the patients relapse, either immediately or at a later time after surgery.[6,7] A reoperation using an extended resection type, like anteromedial temporal lobectomy, can be a treatment option for patients with persistent seizures postoperatively.

The aim of the present study was to examine the postoperative outcome in temporal lobe epilepsy patients who underwent reoperation after a failed epilepsy surgery. We systematically analyzed the results of comprehensive preoperative evaluations (demographic data, ictal and interictal discharges on scalp EEG,

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seizure semiology, magnetic resonance imaging, neuropsychological test-results) before the first surgery, and before and after reoperation. In addition, we attempted to determine what factors, if any, might predict a successful outcome after reoperation.

2. Methods

2.1. Patients

We retrospectively analyzed the data of patients who were evaluated and operated at our institution between 1993 and 2010. The inclusion criteria were medically intractable temporal lobe epilepsy, no evidence of malignant brain tumour and a follow-up period for outcome classification of at least 12 months.

Between December 1993 and December 2011, 487 surgical interventions for the management of epilepsy were performed at our institution. Three hundred and thirty six patients (152 male, 184 female) underwent resective epilepsy surgery for medically refractory TLE, 146 patients underwent selective amygdalohippocampectomy (sAHE), 113 patients had anteromedial temporal lobectomy (AMT) and 77 had tailored temporal lobe resection (TR).

Two hundred and forty four patients (72.6%) were free of disabling seizures (Class 1a to Class 2 according to Wieser's classification[8]) at least 12 month before observation points.

All patients who had persistent seizures after the first epilepsy surgery (Class 3–Class 5 according to Wieser's classification) were offered a re-evaluation and, if possible, reoperation. We excluded from further analysis patients who refused re-evaluation (47 patients), or reoperation (12 patients) and patients with incomplete data or lost follow-up (16 patients) data after reoperation. In the end, 17 patients (6 male, 11 female) who underwent reoperation after an extensive re-evaluation were included in subsequent analyses. The protocol of the study was reviewed and approved by local Ethics Committee.

2.2. Presurgical evaluation

All patients were subjected to extensive evaluation before surgery. The presurgical work-up comprised neurologic examination and history, prolonged Video-EEG-monitoring, high resolution magnetic resonance imaging (MRI), Wada-testing for assessment of language and memory functions, formal neuropsychological testing and visual field examination using the standard automated perimetry exam. In the majority of patients interictal single photon emission computed tomography (SPECT) and interictal positron emission tomography (PET) were performed.

Video-EEG-monitoring was recorded for an average of 5 days; the EEG was recorded according to the extended International 10–20 System including bilaterally placed sphenoidal electrodes. Seizure semiology and clinical lateralizing signs during the seizures were evaluated with respect to prediction of the side of the epileptogenic zone.[9] Absolute spike frequency and location of interictal epileptiform discharges (IEDs) were assessed by visual analyses over the entire recording time. The distribution of IEDs was defined as unilateral if >90% of spikes occurred over the affected temporal lobe.[10] Ictal scalp EEG patterns were determined by morphology, location and time course of ictal EEG changes.[11,12] The results of Video-EEG-monitoring were considered *congruent* if the patient had ipsilateral unitemporal IEDs, ipsilateral temporal ictal EEG patterns and clinical lateralizing signs corresponding to ipsilateral temporal region or non-lateralizable signs clearly corresponding to temporal lobe origin, i.e. oral automatisms, behavioural arrest, etc. The results were considered *incongruent* if one of the following was applicable: IED distribution was bitemporal or predominantly contralateral, ictal EEG patterns could not be clearly localized over the affected temporal lobe and the clinical ictal semiology was lateralized to contralateral side.

All patients underwent a high-resolution MRI scan using a 1.5 T machine (Philips Gyroscan ACS-NT; Best the Netherlands). Starting from 2006 MRI was carried out on a 3.0 T machine. A temporal lobe protocol was applied for detailed depiction of temporal lobe structures (guidelines for neuroimaging evaluation of patients with uncontrolled epilepsy considered for surgery).[13]

2.3. Surgical procedure

Depending on the results of the comprehensive preoperative evaluations, the patients were subjected to following surgical procedures: selective amygdalohippocampectomy, anteromedial temporal lobectomy or tailored temporal lobe resection. The decision regarding the type of operation to be performed was made individually for each patient after completing the presurgical work-up and case discussion at a multidisciplinary epilepsy conference. All surgeries were done by one neurosurgeon (T.C.) between 1993 and 2010. The resected tissue was sent for histopathological analyses in all cases.

2.4. Postoperative outcome

The postoperative follow-up was assessed one, two, five and 10 years postoperatively. It included neurological examination, scalp EEG, MRI, neuropsychological testing and visual field examination. In addition, the seizure outcome was evaluated yearly based on telephone interviews. The outcome was scored using the stringent classification of the International League Against Epilepsy.[8]

Overall from 336 operated patients 244 patients (72.6%) were free of disabling seizures (ILAE Classes 1a, 1 and 2): 109 patients with sAHE (74.7%), 80 patients with AMT (70.8%) and 55 patients with TR (71.4%). These results are presented in Table 1. The patients who failed after the first operation were offered a re-evaluation according to criteria described above and, if possible, a reoperation. Again, the decision regarding the type of reoperation to be performed was made individually after completing the reevaluation and case discussion at a multidisciplinary epilepsy conference. After the reoperation the patients were subjected to postoperative follow-up using the same criteria that were used after the initial operation.

2.5. Analysis of the data of reoperated patients

Only reoperated patients were included in subsequent analysis. We preformed an analysis of different variables in order to assess prognostic significance and to find the best predictors for successful outcome. These variables included history of febrile seizures, TBI, infectious brain diseases, perinatal pathology, morphological changes on MRI, concordance of results of Video-EEG-monitoring with side of operation, type and extent of operation and histopathology.

Table 1
Postoperative outcome of 336 patients with TLE after sAHE, AMT and TR.

	Free of disabling seizures	Not seizure-free	Sum
sAHE	109 (74.7%)	37 (25.3%)	146
AMT	80 (70.8%)	33 (29.9%)	113
TR	55 (71.4%)	22 (28.6%)	77
Sum	244 (72.6%)	92 (27.4%)	336

TLE, temporal lobe epilepsy; sAHE, selective amygdalohippocampectomy; TR, tailored resection; free of disabling seizures, ILAE classification; Class 1a, Class 1 and Class 2; not seizure-free, ILAE classification, Classes 3–6.